might be based upon a more extended theory, such as that of Sohncke or that of Fedorow and Schönflies, and would lead to all known varieties of crystal symmetry. Such a deductive method is not, however, one which has ever commended itself to scientific teachers in this country, and it is not one which can be logically adopted in a book dealing solely with the morphology of crystals.

The second method is the one introduced by Gadolin; it inquires in how many ways a figure obeying the law of rational indices can be symmetrical according to the number and distribution of its planes and axes of symmetry, and it leads satisfactorily to all the known varieties of crystals. It was employed by Liebisch, and has been carried to its utmost extreme in the new edition of Groth's "Physikalische Krystallographie," where the systems are geometrically little more than artificial groups constructed by synthesis of the various types, the conception of mero-symmetry being completely abandoned. Prof. Maskelyne treats of planes before axes of symmetry, and regards the latter as begotten by the former; accordingly he is compelled to introduce the idea of mero-symmetry as a second empirical law, whereas the method of Gadolin requires the one law of rational indices alone. In the opinion of the present writer, Gadolin's is the most, indeed the only, logical process. It must, however, be confessed that the method of Prof. Maskelyne possesses a simplicity which is important from the educational point of view, and might alone be sufficient justification for its use; that he has considered and rejected other possible courses is clear from the discussion on p. 171, which leads to the following suggestive remark: "It is, however, evident that the whole treatment of crystallographic symmetry on the assumption of planes and axes of symmetry, actual or potential, represents a geometrical abstraction; an abstraction that needs for its development and due explanation a complete science of position applied to the molecular mass-centres."

In the preface it is stated that the greater part of the present treatise has long been in print; this being the case, the earlier part must inevitably be somewhat out of touch with recent discovery, and since there is no list of errata, statements which are not, like the geometrical propositions, unassailable, must be received with due caution. Thus milk-sugar is stated to be orthorhombic, it has recently been proved mono-symmetric; the whole of § 314 should now be cancelled. Again, § 140 must be read in the light of § 266. Cuprite is described both as holo-symmetrical and as hemi-symmetrical; but the intelligent reader will find the most important of such contradictions implicitly corrected in a table of crystalline types, with authentic examples, given on p. 502. This table is introductory to eight useful plates which deserve special attention, since they represent all the varieties of merohedra and their relations, and render the previous descriptions easily intelligible.

The appearance of this book is an interesting event in the history of crystallography. The volume stands as a striking and permanent record of the original manner in which this science has for many years been treated by the Oxford Professor in lectures, of which the substance is now for the first time made public. By those who have had the privilege of personal acquaintance with his teaching, it will be welcomed as the familiar echo of a style of exposition singularly adapted to kindle enthusiasm for an abstruse subject, and by the scientific public, as an authoritative treatise on a science of which the growing importance is continually becoming more fully recognised.

H. A. MIERS.

THE STUDY OF STEREOCHEMISTRY.

Stéréochimie. Exposé des théories de Le Bel et Van't Hoff. Par E. G. Monod, avec une préface de M. C. Friedel. (Paris: Gauthier-Villars et Fils, 1895.)

THIS is a small book of 162 pages which gives a clear account of the fundamental ideas upon which is founded the modern doctrine of chemistry in space, which sprang, as every one knows, out of Pasteur's classical researches on the relation between optical activity and crystalline form. Much fault need not be found with this book because it contains rather dogmatic statements of debatable propositions, but we venture to think the treatment of the subject too sketchy and superficial to afford much real help to the student.

M. Monod's little book relates only to the stereochemistry of carbon, and the isomerism of nitrogen compounds is not referred to. Now this department of theoretical chemistry is one which should be entered by the student at a comparatively advanced stage of his progress, when he is already familiar with the more important facts upon which the theory is based. It seems doubtful, therefore, whether so scanty an outline as this will supply what is wanted by students at this stage. They will desire to be told not only that a certain number of groupings are possible with a stated number of carbon atoms, which is usually obvious enough, but they will require to be told something of the secondary hypotheses with which the fundamental idea has become encrusted. For example, the union between two carbon atoms joined by a single bond is shown (p. 17) to be "mobile," that is, each carbon is supposed to be able to rotate, together with its attached radicles, round the axis joining the two carbons; but the student is left at that point to wonder why it should rotate at all. It is only much later (p. 63), in connection with the isomerism of fumaric and maleic acids, that reference is made to the doctrine of attractions between the radicles associated with carbon atoms adjacent to each other. In this case it is not justifiable to say that the attraction of CO_2H for H is *evidently* greater than that of CO_2H for CO_2H or H for H. There is nothing *evident* about the statement, which is almost purely hypothetical, such evidence as does exist tending almost as much one way as the other.

Throughout the book the conventional tetrahedron is the symbol used, and we have not been able to find any account of Wunderlich's hypothesis as to the configuration and union of carbon atoms, nor of Baeyer's strain theory in the formation of closed chains, nor of any other explanation of the way in which two carbons may unite by double or triple bonds, and the consequences of such union.

The most interesting part of the book is the brief fourth section, which relates to the researches and hypotheses of Guye as to the relation between the rotatory power of the substance and the masses of the radicles attached to an asymmetric carbon in the molecule of an optically active compound.

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One word more. The short preface by Prof. Friedel explains, as follows, the object of the book: "La branche de la science chimique à laquelle on a donné le nom de stéréochimie ou chimie dans l'espace est de date toute récente. Elle a été créé par MM. A. Le Bel et Van't Hoff: . . . A l'étranger les publications d'ensemble faites pour répandre ces notions ne manquent pas. Il n'en est pas de même en France," &c. This seems strange, while close by, rue S. André des Arts, may be had Meyerhoffer's edition of Van't Hoff's celebrated "Dix années dans l'histoire d'une théorie," a book of infinitely greater interest than the volume before us.

A practice has grown up of late years of inserting into text-books by obscure authors little prefaces by better-known men, containing nothing in particular in the way of information, and in which the laudatory expressions are not always quite justified by the character of the book. So long as "puffing" is regarded as allowable, there is no very clear reason why it should not be permitted in connection with books; but the sort of preface referred to, has rather too strong a family likeness to the "certificate" so often found on the label of hair-restorers and packets of cocoa, to the virtues of which these writers of prefaces would probably in most cases shrink from testifying.

OUR BOOK SHELF.

The Telephone Systems of the Continent of Europe. By A. R. Bennett. (London: Longmans, 1895.)

WITH what object was this book written? The introduction is a violent diatribe against the telephone powers that be in England; and yet by his titles, the author seems to have been nursed in their service. Moreover, England and Germany with their 162,000 telephones, rank next to the United States, and possess more telephones than all the rest of Europe put together. In fact, next to Scandinavia and Switzerland, England ranks above Germany in telephonic development—the rest of Europe being "nowhere." Why, therefore, this wailing and gnashing of teeth? Why should England and Germany alone in Europe excite his wrath? Is it that they will not adopt at home his views of low rates and, perhaps, no profits, and did his apparent rough treatment in Berlin prejudice his judgment of German ways? The book is full of statistics of the growth and development of the business in different European countries—except England. It indicates the public uses to which telephones can be applied, but it contains little that is scientific or practical. Its facts are fleeting, and its *raison d'être* is not evident.

The development of telephony in Sweden is very remarkable. The difficulty of locomotion, and the long dark days in winter, may account for much of it. In a population of 4,824,000 there are 26,201 telephones in use. This means one telephone to 184 inhabitants. In the United States there is one telephone to 270 inhabitants.

In Switzerland it is even more developed than in Sweden. The difficulties of locomotion and internal communication, the isolation of valleys, that gold mine to the country—the great summer tourist traffic—and hotel life, may account for this, but the author attributes its success solely to its cheapness. In fact it is too cheap, for it does not pay, and this state of things is not conducive to future prosperity.

The great development of telephony in the United States, where there are 232,140 subscribers in spite of very high rates, does not support the views of the author.

The annual charge in Switzerland was originally 150 francs per annum for an unlimited local service, and an additional 25 francs per annum to cover trunk or inter-urban service. It was soon found necessary to charge 20 centimes per talk of five minutes on trunk lines. Since 1890 the local charges have been 80 francs per annum with 800 free talks, and 5 centimes per extra talk, and the trunk charges per three minutes, 30 centimes for any distance up to 50 kil., 50c. to 100 kil., and above 100 kil. 75c. From January 1, 1896, it will be a very practical and sensible tariff, viz. an initial annual charge of 40 francs and a uniform charge of 5 centimes for all local talks, the trunk charges remaining unchanged. The number of talks per annnm per subscriber during 1894 was—local 504 and trunk 85, but the trunk traffic in many places far exceeds the local. In Affoltern, for instance, during 1894, there were only 105 local talks, while the trunk talks amounted to 8167 (*Journal Telegraphique*, May 25, 1895). There were at the end of 1894, 18,814 subscribers in Switzerland. This means one telephone to 147 inhabitants.

A word is wanted badly to express a telephonic conversation or talk analogous to "telegram." The author's "telephonogram" is lengthy. "Phonogram" is in use in connection with the phonograph. "Telelogue" has been proposed, but has not met with general approval

The Elements of Health. By Louis C. Parkes, M.D. D.P.H. (London: J. and A. Churchill, 1895.)

THE author of this manual states in the preface that his "main idea has been to give some simple yet practical information on the preservation of individual or personal health." It is impossible to say, with any degree of certainty, who is to be accorded the distinction of having originated such an "idea." Certainly Hippocrates undertook the writing of treatises on hygiene, and even he was only following in the footsteps of others. This preliminary remark mainly arises out of the fact that when another manual of hygiene appears, one's natural impulse is to turn to the preface, in order to see if the author has any new motive to suggest for its appearance; for the fact is, there is, at present, a superabundance of such works. Dr. Parkes' manual, good as it is, contains practically nothing that cannot be found in any of the other dozen or more elementary treatises dealing with the same subject; and to those who are familiar with the same author's work upon "Hygiene and Public Health," it will be sufficient to state that the present volume under review is practically that work popularised and very much abridged.

The illustrations are excellent; and it is a positive relief to find that they show a little freshness in their treatment, and are something more than the stock figures that appear in so many similar publications.

Dr. Parkes occupies a deservedly high position among sanitarians, and it goes without saying that his teachings are sound. There are only two points which call for adverse criticism. The table on page 168 needs revision; the author is well aware that the fat in butter does not average 88 per cent.; indeed, on a subsequent page (196) he himself puts it down at 83 per cent.; and his statement that it is "doubtful if alum (in bread), unless present in considerable quantity, is able to influence health adversely," is also open to criticism. In the first place, it is doubtful whether, if such be the case, it is prudent to make so loose a statement in what is designed to be a popular work for the lay reader. There is little doubt that the hydrate of alumina, which results from the use of baking powders containing alum, is soluble in the hydrochloric acid of the gastric juice, and there are many good reasons for regarding such addition as very undesirable; it would, moreover, probably prove harmful when present in what may be held to constitute less than a *considerable quantity*.

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